

PREDICTING EXERCISE ADHERENCE IN COMMUNITY POPULATIONS

Examining the role of motivation and cognitive change in predicting long-term exercise adherence in community populations.

Leia Giacon

A report submitted as partial fulfilment for the degree requirements of the Bachelor of Behavioural Science with Honours at the University of Tasmania 2015.

Statement of Sources

I declare that this is my own original work, and that the contributions of others have been duly acknowledged.

Leia Domenica Giacon

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Abstract

Despite the many benefits of exercising for both physiological and psychological health, almost half of the Australian population is insufficiently active. Using the self-determination theory, the transtheoretical model, self-efficacy and outcome expectancy theory as the literary framework, this study examined the predictors of long-term free-choice exercise adherence in a community sample. An online questionnaire battery was distributed to new gym members from the general community ($N = 59$) to measure their type of motivation, cognitive stage of change, level of self-efficacy for exercise and perceived outcome expectancy toward exercise, three times over a 12 week period. Results revealed that only stage of change was a successful predictor of exercise adherence. Further, transition between stages over the three collection times related to the trajectory of participant adherence over the 12 weeks. Findings in this study integrate recent work of community populations into the growing body of research focusing on the determinants of exercise. It is proposed that unexplained constructs exist in community populations that do not exist for specialised research populations and current theory may be insufficient in accounting for behavioural patterns outside those specialised populations.

Keywords: exercise, community, adherence, self-determination, stage of change, self-efficacy, outcome expectancy, motivation, gym.

Examining the role of motivation and cognitive change in predicting long-term exercise adherence in community populations.

Engagement in regular physical activity benefits physiological and psychological health. Such benefits include lower probability of coronary heart disease, adult onset diabetes and obesity as well as increased life expectancy, heightened self-esteem and greater levels of positive affect (Begg, Vos, Barker, Stevenson, Stanley, & Lopez, 2007; Oguma & Shinoda-Tagawa, 2004; Ryan, Patrick, Deci, & Williams, 2008). Engaging in exercise further facilitates behaviours that are protective against depression and other mental health disorders (Rhodes, Fiala, & Conner, 2009; Rogers et al., 2005). Despite these known health benefits the World Health Organisation (WHO, 2010) estimates that more than 60% of the global population is insufficiently active to profit from regular exercise. As such, from a health psychology perspective, understanding the predictors of long-term exercise adherence is a relevant and beneficial avenue of research. Researching this area requires the explanation of how and why people are driven to exercise, and whether these factors vary for an individual, and between individuals over time, once exercise has begun.

Current Physical Activity in Australia

Reports from the 2011-2013 Australian Health Survey (AHS) indicate that almost 12 million Australians have sedentary or low levels of exercise (AHS, 2013). The Australian Department of Health's National Guidelines for Physical Activity recommend that adults engage in approximately two to five hours of moderate intensity or one to three hours of vigorous intensity exercise every week (Australian Government, 2015). However, according to the Australian Institute of Health and Welfare, 66.9% of Australians aged 15 years and over are not active enough to meet

this minimum threshold (AIHW, 2014; WHO, 2007). A geographic breakdown of insufficient activity by state reveals that Tasmania (68.2%) is second to only New South Wales (83.3%), which has the highest prevalence of sedentary lifestyle (AHS, 2013). The Australian National Heart Foundation further demonstrated that over half (54.2%) of the 30-65 age bracket felt they were not physically active enough to stay healthy (Chew et al., 2011). In this survey, lack of time (44.5%) was reported as the main barrier to exercising regularly, followed by not enjoying exercise (39.5%) (Chew et al., 2011).

Burdens of a Sedentary Lifestyle

Physical inactivity is the fourth leading risk factor for mortality, annually contributing to 6% of deaths worldwide (WHO, 2010). In Australia, sedentary lifestyle is a leading modifiable health risk factor that contributes to the burden of disease and injury (Begg, et al., 2007). Along with genetic susceptibility and over-eating, insufficient exercise is a primary contributor to child and adulthood obesity (Rogers et al., 2005); with secondary health outcomes including increased risk of cardiovascular disease, Type 2 diabetes, hypertension and colon and breast cancers (Oguma, & Shinoda-Tagawa, 2004). Additionally, of the known cancer risks, inactivity is the second greatest contributor to the cancer burden in Australia, after tobacco smoking (AIHW, 2014; Nocon, Hiemann, Muller-Riemenschneider, Thalau, Roll, & Willich, 2008). Inactivity has also been connected with negative mental health outcomes; reducing general quality of life and mental wellbeing for age populations ranging from children (Hills, King, & Armstrong, 2007) and teenagers (Bourdeaudhuij et al., 2005), to adults (Brown, Burton, & Rowan, 2007) and among the elderly (Stessman, Hammerman-Rozenberg, Cohen, Ein-Mor, Jacobs, 2009).

Burdens additionally manifest in negative economic outcomes at both personal and societal levels. From 2006 to 2007, the direct health care costs of physical inactivity in Australia were estimated at \$1.5 billion, of which \$469 million was attributable to falls and \$372 million to coronary heart disease (Econtech, 2007). This statistic excluded secondary economic consequences such as longer periods of absence from work resulting from sedentary related health problems (Oguma, & Shinoda-Tagawa, 2004); with such costs included, the total cost of obesity to the Australian society and governments was estimated at \$58 billion (Access Economics, 2008).

Benefits of Physical Activity

Physical activity builds muscle strength and endurance and increases flexibility, with such gains being causally linked to preventing injury and disability (Sherwood & Jeffery, 2000). Positive effects of exercise on health include reducing stress and anxiety levels, improving cognitive performance and emotional wellbeing, increasing energy levels, self-confidence and satisfaction in social activities, and generating improved quality and duration of sleep (Brown et al., 2007; Nocon, et al., 2008; Sherwood and Jeffery, 2000). Exercise is also considered to be an important adjunct to many medical and psychological treatment plans (Oguma, & Shinoda-Tagawa, 2004). Evidence also references the role of exercise in reducing all-cause mortality risk for older populations (Heesch, Burton, Brown, 2010).

In summary, sedentary/low levels of exercise are prevalent in Australia and costly to health and economy for both the individual and the community. Presented statistics confirm that most Australians do not exercise enough. The evidence illustrates the health problems associated with inactivity and highlights the preventative benefits that ensue from regular exercise. In response to this evidence, a

more informed understanding of the theory explaining how and why people are driven to engage in and persist with exercise is germane.

Predicting Exercise Adherence

In investigating how and why people are driven to exercise, the “how” refers to how people are motivated or driven to initiate and persist with actions, to the point where these actions are permanently implemented into daily life.

Self-Determination Theory

Self-determination theory is a macro theory of human motivation. Where many contemporary theories assume that people persist at behaviours because they are motivated to achieve a desired outcome or goal (Standage, Sebire, & Loney, 2008), self-determination theory differentiates between the content of goal-directed action and the regulatory process by which that content is pursued (Deci & Ryan, 2000). In the context of exercise, a basic qualification of motivation is the concept that individuals can be simultaneously, intrinsically and extrinsically motivated towards exercise (Deci & Ryan, 2000; Standage et al., 2008). Intrinsic motivation is exercising on the basis of the inherent pleasure and satisfaction exercise provides. The enjoyment of the physical activity is the reward in itself and so needs no exogenous incentive or expected reward to motivate performance (Ryan & Deci, 2000). In comparison, extrinsic motivation describes exercise with the expectation of gaining a separable outcome, be it a reward, the avoidance of a punishment or the attainment of a third party’s approval or recognition (Ryan & Deci, 2002).

The ability for the individual to be motivated on both an internal and external level is enabled by a spectrum of self-regulated motivation. The self-determination theory presents a continuum of regulated autonomy, referencing four consecutive types of motivation that differ depending on how self-determined the person is at any

given time (Deci & Ryan, 2000). At the lower or controlled end of the continuum is *External Regulation*, in which behaviour is actioned to gain a reward or avoid punishment administered by others. Further up is *Introjected Regulation*, in which behaviour is driven by internalised contingencies of self-aggrandisement or the avoidance of self-derogation (Ryan, 1982). Therefore, the individual will exercise in order to feel pride or avoid feeling guilt or shame for not exercising (so regulation is still controlled as the action is second to the emotional consequence). Moving further along the continuum is *Identified Regulation*, in which behaviour is based on the personal value placed on the action's consequence. For example, if a person places a value on being healthy, they will be motivated to exercise more; here regulation is somewhat autonomous though the behaviour is still contingent upon expected consequences (Ryan & Deci, 2002). Finally *Integrated Regulation* is fully autonomous and self-determined engagement as the exercise is coherent with the identity, self-concept, personality schemas and values of the individual; the individual is motivated by the enjoyment they obtain from exercise and inherently sees themselves as being fit. The self-determination theory suggests that the process of developing autonomous motivation facilitates behavioural engagement, which is known as internalisation (Ryan & Deci, 2002).

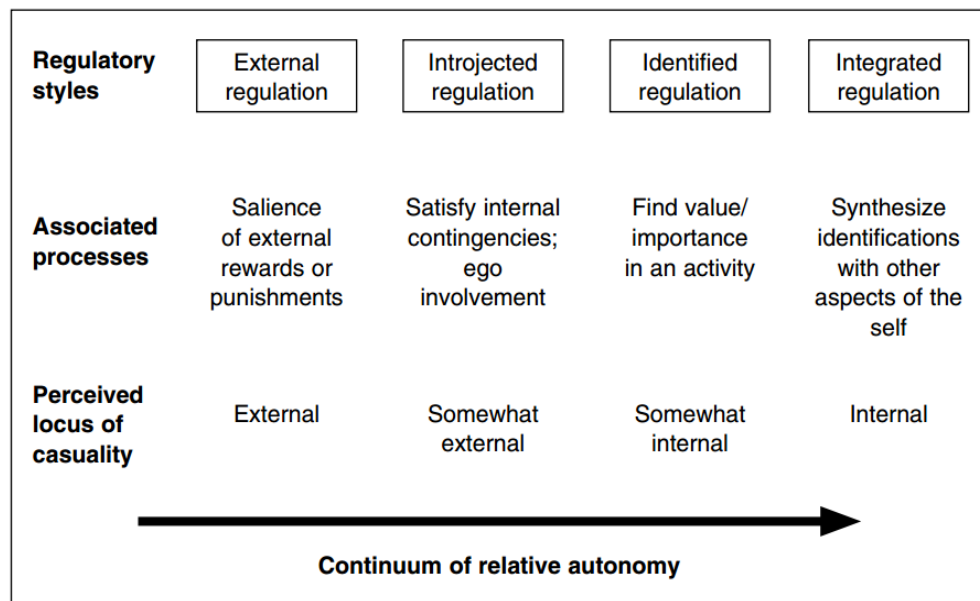


Figure 1. Conceptualising motivation using the continuum of relative autonomy in the Self-Determination Theory (adapted from Deci & Ryan, 1985; as cited in Niemiec & Ryan, 2009).

The self-determination theory has been recommended as an appropriate framework for understanding engagement in exercise (Biddle & Nigg, 2000; Landry & Solomon, 2002; Standage et al., 2008). Cross-sectional research in sport and educational settings has shown that autonomous forms of motivation positively predict exercise of university students (Pelletier, Fortier, Vallerand, & Briere, 2001; Puente & Anshel, 2010), and the training adherence of elite swimmers (Pelletier et al., 2001). Furthermore, exercise intervention studies evidence greater behavioural engagement for intrinsically rewarding physical activity (autonomously motivated) than extrinsically rewarding (controlled motivation) (Fortier, Williams, Sweet, & Patrick, 2009; Rhodes et al., 2009). Whilst the majority of research concerning self-determination has been investigated within cross-sectional designs (Rhodes et al., 2009), longitudinal research of a cardiovascular-based exercise program over a 12

week timeframe has also evidenced greater adherence for identified regulation and intrinsically motivated participants (Edmunds, Ntoumanis, & Duda, 2007).

The Transtheoretical Model – Stage of Change

Having used self-determination theory to explain mechanisms for “how” people are driven to exercise, it becomes pertinent to consider a preceding construct that facilitates “why?” The transtheoretical model provides a framework that distinguishes cognitive stages involved in the implementation and perseverance of adaptive health behaviours (Prochaska & Marcus, 1994; Daley & Duda, 2006). Stage of change is a sub-theory within the transtheoretical model that outlines five separate, though interconnected stages of cognitive transition. Stage of change proposes that for health behaviours to occur a person will progress sequentially through (1) *precontemplation*, (2) *contemplation*, (3) *preparation*, (4) *action*, and (5) *maintenance*. In relation to exercise, *precontemplation* is characterised by no cognitive intention to engage in exercise in the near future (the following six months). Alternatively, the individual may have attempted unsuccessfully to start exercising so many times they have given up (Daley & Duda, 2006). The *contemplation* stage involves cognitive ambivalence towards exercise. The individual will assess barriers from and benefits to engaging in exercise during this stage (Prochaska & Marcus, 1994). *Preparation* is characterised by a cognitive commitment and intention to exercise. The individual may experiment with trials of exercise as their determination and motivation to change increases (Daley & Duda, 2006). In this stage self-determination theory offers explanation of the internalisation process the individual may experience (Indledew, Markland, & Medley, 1998; Pelletier et al., 2001). By the *action* stage, the individual is actively involved in exercising and responds to physiological, psychological and social feedback to fuel

continued motivation (Daley & Duda, 2006). If this action is sustained over time (typically 6 months), the individual has reached the *maintenance* stage. This stage involves incorporating the new behaviour over a prolonged period of time for the exercise to become habit and no longer perceived as change (Prochaska & Marcus, 1994). Stage transition is non-linear and dynamic as people will commonly fail in initial or multiple efforts to establish and maintain a behaviour, which is reflected in stage regression or relapse (Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994).

Stage of change provides further explanation for the variance in patterns of exercise behaviour over time. As previously mentioned, stage transition is unstable. This means individuals vary in terms of how rapidly they move, and the direction by which they move to and fro between stages (Daley & Duda, 2006). As the individual experiences the cognitions involved in each stage, their engagement in exercise fluctuates. The individual will progressively increase in exercise the higher up the stage ladder they progress, as they head towards cognitive maintenance. With relapse or stage regression, however, the individual will decrease in engagement as they re-enter the ladder at a lower stage and revert to processing lower stage cognitions (Daley & Duda, 2006).

Empirical research has demonstrated that stage of change is an effective predictor of engaging in adaptive health behaviour. For example, predicting success and relapse in smoking cessation behaviour (Farkas, Pierce, Zhu, Rosebrook, Gilpin, Berry, & Kaplan, 2009) as well as contraception use (Prat, Planes, Gras, & Sullman, 2012). Exercise specific research has additionally shown adherence as reflective of preparation to maintenance stages and non-adherence reflective of pre-contemplative and contemplative thought (Bredahl, Singhammer, & Roessler, 2011; Daley & Duda,

2006). Studies utilising transtheoretically-based interventions have demonstrated that stage of change recorded upon exercise initiation can predict participant progression from contemplative to preparation and action stages over time (Marshall & Biddle, 2001; Prochaska & Marcus, 1994). Although the research presented supports the predictive ability of stage of change on exercise, there has been little empirical attention focused on theorised stage regression, and more specifically, the consequence of this regression on adherence to exercise.

Self-efficacy

It is necessary for the current study to consider underlying factors presented by the literature that may influence self-determined motivation and stage of change. The first of these factors is self-efficacy. Self-efficacy was introduced to the health psychology sphere by Bandura (1986) to aid the explanation of the processes that underlie behavioural engagement. Self-efficacy is defined as:

People's judgements of their capabilities to organise and execute courses of action required to attain designated types of performances. It is concerned not with the skills one possesses, but rather with judgements of what one can do with whatever skills one possesses (Bandura, 1986, p. 391).

Within an exercise context, self-efficacy can be defined as the individual's belief in their capability to exercise, even when faced with barriers or obstacles (Bandura, 1997; Sniehotta, Scholz, & Schwarzer, 2005). Self-efficacy has been attributed with influencing self-determined motivation and stage of change (Bredahl et al., 2011); high self-efficacy facilitates internalisation (towards autonomous motivation) and more rapid progression between stages of change, particularly from contemplation to preparation (Bredahl et al., 2011; Pelletier et al., 2001; Sniehotta et al., 2005). This is because if the individual has already established high efficacy they do not need to

take the time within their current stage, to evaluate their behavioural confidence and capacity to exercise in order to form a self-efficacy belief (Jones, Harris, Waller, & Coggins, 2005). Low self-efficacy, on the other hand, can generate a cognitive barrier as the individual is forced to rely on external motivators, because they doubt their own ability to engage in and enjoy physical activity (Jones et al., 2005). This doubt may reduce motivation and intention to engage in exercise, and facilitate stage regression from preparation, or total stage relapse, so resulting in lower adherence to exercise (Bredahl et al., 2011; Sniehotta et al., 2005).

Self-efficacy has been utilised as a standard initiatory construct for health behaviours in theory and research. Additionally, high self-efficacy belief has been referenced as a primary and consistent predictor of exercise engagement in adults, (Bandura, 1997; Trost, Owen, Bauman, Sallis, & Brown, 2002). Exercise intervention research shows greater behavioural engagement when perceived behavioural control is high (Ekkekakis, Lind, & Joens-Matre, 2006). Thus, self-efficacy theory facilitates a better understanding of the cognitive fluctuation an individual will experience in their self-determined motivation and stage of change throughout their endeavour to exercise.

Outcome Expectancy

Outcome expectancy is a construct that frequently coincides with self-efficacy in explaining patterns of health behaviour (Dzewaltowski, Noble & Shaw, 1990; Maddux, 1993). Within the context of physical activity, outcome expectancy refers to the positive and the negative health perceptions of outcomes from exercise (King, 2001; Williams, Anderson, & Winett, 2005). For example, an inactive person may consider exercise to benefit their health, through visceral fat or body fat loss, but they simultaneously may consider joining a gym to be too demanding on monetary

or energy resources (Maddux, 1993). If the expectation of positive outcomes outweighs negative outcomes, the individual will increase their intention to exercise (King, 2001; Williams et al., 2005). Hence, outcome expectancy has also been theoretically linked with self-determined motivation and stage of change.

Outcome expectancy can influence the internalisation of autonomous motivation and progression from contemplation to preparation stages of change in a similar way to self-efficacy. If negative outcomes are prominent they are likely to have a depressive effect on intention and so reduce the motivation sourced from the exercise itself (Maddux, 1993). This result is because, if the individual's intention to commit to exercise is reduced (linked to stage regression), they will likely fail to seek cognitive motivators of engagement, as they do not anticipate preferred outcomes to ensue, thus having lowered self-determine motivation (King, 2001; Williams et al., 2005). Antithetically, positive outcome dominance will fuel overall motivation (regardless of whether it is intrinsic or extrinsic) as the individual is driven to reach desired outcomes, making them more likely to commit over time (King, 2001; Williams et al., 2005). Additionally, this elevation in motivation increases the likelihood that the individual will internalise and be autonomously driven by the behaviour itself (King, 2001; Maddux, 1993; Williams et al., 2005).

Outcome expectancy has been consistently used as an explanatory construct in the theoretical and empirical literature of health behaviour (Dzewaltowski et al., 1990; Garcia & Mann, 2003). In research of exercise, positive outcome expectancy predicts greater engagement in physical activity than negative outcome expectancy (Bandura, 1997; Bredahl et al., 2011; Trost et al., 2002). The inclusion of outcome expectancy, in the theoretical framework used to predict exercise adherence,

therefore allows the subjective perceptions of outcomes to be considered in relation to level of exercise engagement.

Limitations in the Literature

The above theories provide a solid foundation for understanding the predictors of exercise adherence. However, there are shortcomings within the empirical validation of these theories that need to be addressed. For self-determination theory, the empirical literature has yet to investigate the long-term adherence of new amateur exercisers in unspecialised populations. Thus far the presented research has sampled university students whose participation was a requirement of the curriculum (Puente & Anshel, 2010), elite athletic swimmers (Pelletier et al., 2001) and a cohort of clinically obese patients (Edmunds et al., 2007). Therefore, despite the theory of self-determination implying empirical consistency, there is limited research that involves random community samples.

Further, the outcome variable of exercise adherence in these studies was potentially inappropriate and inconsistent in its measurement. In the case of Puente and Anshel (2010), exercise adherence was operationalised as the one off participation of students in an exercise class. Another study presented the outcome measure as the attendance in the last of 12 exercise sessions (Williams, Anderson, & Winett, 2005). The convenience of operational definitions of adherence, in these cases, seems inappropriate considering results are used as evidence that self-determination is a valid predictor of ongoing exercise. Therefore, the current study intends to address these empirical inadequacies by sampling the general community and consistently measuring free-choice exercise over a three month period.

Stage of change sufficiently explains the dynamic cognitive phases that facilitate exercise engagement (Daley & Duda, 2006). However, this model is

restricted by limited evidence of the regression or relapse in stage and the consequent outcome on exercise adherence over time. Rather cross-sectional research facilitates confirmatory results without testing the more nuanced, detailed elements of the theory on consequent action (Bredahl et al., 2011; Daley & Duda, 2006). In response, the current study intends to examine the transition of stage of change, along with the other operationalised predictor variables, to consider the dynamics of implementing long-term exercise change.

Additionally, the theory indirectly implicates stage of change as the greatest predictor of exercise, as the stage ladder sets the foundation for engagement, whilst self-determination, self-efficacy and outcome expectancy influence the duration the individual spends in their current stage and the rapidity of their stage transition (Bredahl et al., 2011). However there is limited research involving the collaboration of these four specific variables. Therefore the current study intends to explore a hierarchy of predictors for exercise, in which stage of change is demonstrated as the greatest predictor when compared with self-determination, self-efficacy and outcome expectancy. It is important to note that the current study sampled new gym members. Therefore, it is theoretically assumed that all participants will sit between the contemplation and maintenance stages, having demonstrated progression through pre-contemplative thought in their acquisition of a gym membership.

Whilst self-efficacy and outcome expectancy have been well documented in theory and continually reviewed in relation to exercise, they have not been tested in up-to-date empirical research (Jones et al., 2005; Maddux, 1993). It is therefore necessary to question whether, when operationalised, these constructs contribute to predicting exercise in modern populations and if to the same extent as other theoretical constructs. The current study, therefore, intends to invigilate the

contribution of self-efficacy and outcome expectancy for exercise in a contemporary sample to determine whether these constructs are still valid in accounting for exercise behaviours.

Research Aims

Working from a foundation of existing literature, the aims of the current study were to:

1a) examine the capacity of Stage of Change (SOC), Self-Determination Theory – Relative Autonomy Index (SDT-RAI), Self-Efficacy for Exercise (SEE) and Outcome Expectancy of Exercise (OEE) to predict Exercise Adherence;

1b) test whether change in the predictor variables related to the trajectory in Exercise Adherence over time; and

2) Determine whether previous research findings, which suggest higher SOC, autonomous SDT-RAI, high SEE and positive OEE, facilitate greater Exercise Adherence, generalise to the free-choice adherence of a community sample.

Hypotheses

Operating within the framework of these research aims, five hypotheses are proposed:

1) the largest contributor to a hierarchical regression model will be SOC followed by SDT-RAI and the combined contribution of SEE and OEE respectively; all variables will contribute significantly to the regression model;

2) SOC Action and Maintenance stages will yield greater Exercise Adherence than Precontemplation, Contemplation and Preparation;

3) that autonomous SDT-RAI motivation (Identified Regulation and Integrated Regulation) will produce greater Exercise Adherence than Controlled (External Regulation and Introjected Regulation);

4) high SEE will yield greater Exercise Adherence than low SEE and positive OEE than negative OEE respectively; and

5) transition in predictor variables over the 12 weeks will predict a parallel transition in Exercise Adherence; that is, variable increase, decrease or stability will predict adherence increase, decrease or stability.

Method

Design

A hierarchical multiple regression design will examine Exercise Adherence that can be predicted by a regression model with just SOC (Step 1), adding SDT-RAI (Step 2), and including SEE and OEE (Step 3). Exercise Adherence was the total summed visits to the gym over the 12 weeks, categorised into Block Adherence for weeks 1 to 6 (Block 1) and weeks 7 to 12 (Block 2).

Participants

Sixty-one individuals voluntarily completed the first online battery; of these 59 were included in the final sample (64.4% female, 35.6% male; Mean age = 27.69 years, $SD = 11.15$). The study employed a longitudinal design and participants were new gym members from three participating Tasmanian gyms (Appendix A) who were recruited via advertisements in the reception areas of these facilities (Appendix B). Participant demographic information was also collected (Appendix C). Sample sizes reduced for Time 2 and Time 3 data as indicated in Figure 2.

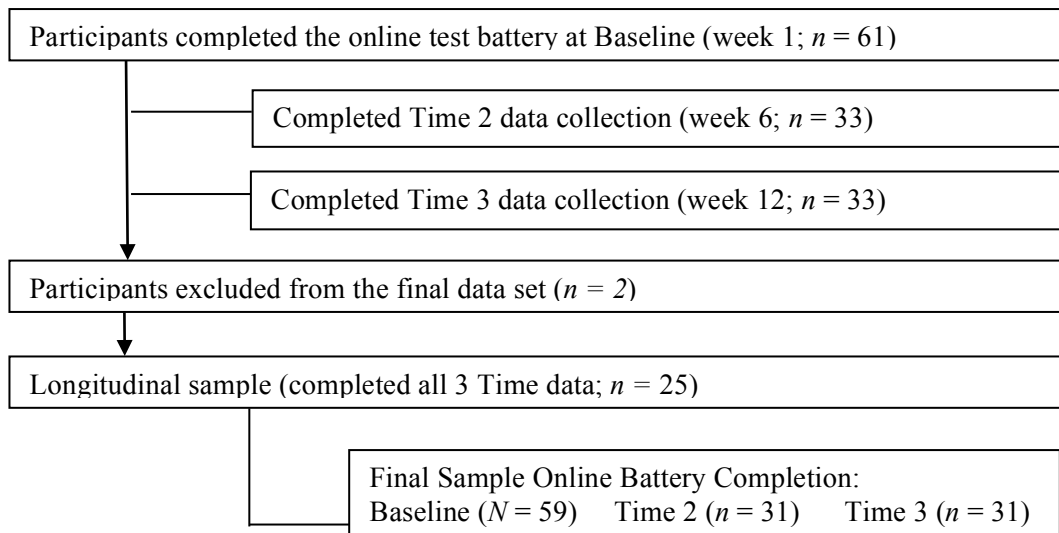


Figure 2. Participant recruitment and longitudinal data collection.

Participants who completed all three data collection sessions went into a prize draw to win a free one month membership at their respective gym.

Measures

The current study used online questionnaires hosted on LimeSurvey (LimeSurvey Inc., 2014) to assess the predictor variables and collect demographic data.

The Exercise Self-Regulation Questionnaire (Ryan & Connell, 1989). This 12-item measure assessed external, introjected, identified and integrated regulation using items concerning “why do you workout?” recorded on a 7-point Likert scale (Not at all True to Very True) (Appendix D). Three items load on to each of the four subscales. Subscale scores were transformed into a composite score on the Relative Autonomy Index (RAI); SDT-RAI was the sole score used for analysis in this study. The SDT-RAI has good internal consistency (Cronbach’s $\alpha = .85$), along with supported convergent and factorial validity (Ryan & Connell, 1989). The internal consistency in the current study was .834.

Exercise: Stages of Change Continuous Measure (SOC) (Marcus, Selby, Niaura, & Rossi, 1992; Dannecker, Hausenblas, Connaughton, & Lovins, 2003).

This measure assesses participant response on a 5-point Likert rating (Strongly Disagree to Strongly Agree) to 24-item statements reflecting particular stage cognitions towards regular exercise. Items load onto six stage categories (the five reported stages of change with precontemplation separated into two categories: believers in exercise as a health behaviour and non-believers) (Appendix E) (Dannecker et al., 2003). Confirmatory Factor Analysis showed each sub-scale as displaying distinct cognitive profiles, with the Action sub-scale displaying the lowest Eigenvalue = .93 (Lowther, Mutrie & Scott, 2007). Subscale-scores were summed with the highest score representing current stage category. The internal consistency in the current study was .754.

The SCI Self-efficacy for Exercise Questionnaire (SEE). This questionnaire was developed by Bandura in conjunction with Stanford University (1997), it is a 10-item scale that assesses an individual's confidence, rated on a 4-point Likert scale (Not at all True to Exactly True), that they can exercise regularly in spite of potential barriers (Appendix F). The total summed score ranges from 10-40 with higher scores pertaining to greater self-efficacy for exercise. Internal consistency was high ($\alpha = .87-.93$), as was test-retest reliability ($t_{test-retest} = .88$) (Kroll, Kehn, Ho, & Groah, 2007). The internal consistency in the current study was .856.

The *Outcome Expectancy for Exercise Questionnaire* (OEE) is an expanded version of the Theory of Planned Behaviour based measure the Benefits of Physical Activity Scale (Sallis, et al., 1989; modified by Rovniak, Anderson, Winett, & Stephens, 2002). Participants responded to 25-items of experiencing particular outcomes of regular exercise on a 5-point Likert scale for likelihood (Not at all Likely to Extremely Likely) and for relative importance (Not at all Important to Extremely Important) (Appendix G). Subscale scores were averaged to form a

composite score in which higher values reflected more positive outcome expectancy. This modified version demonstrated good internal consistency (Cronbach's $\alpha = .89$) and test-retest reliability ($t_{test-retest} = .87$) (Rovniak et al., 2002). The internal consistency in the current study was .897.

Procedure

Ethical approval was granted by the Tasmanian Social Sciences Human Research Ethics Committee (Appendix H). Individuals signing up for gym memberships during the month preceding Baseline were invited to participate. As this study aimed to examine long-term adherence, only individuals who signed up for a membership of over one month (with the option to renew) were recruited. Participants were provided with an information sheet (Appendix I) prior to offering their informed consent (Appendix J). Participants were instructed to complete the questionnaires three times in their membership: in week 1 (Baseline), week 6 (Time 2) and week 12 (Time 3). At Baseline, demographic data was also recorded. Participants were prompted via email to complete Time 2 and Time 3 questionnaires. Adherence data was collated at the end of the 12 week period and entered into a de-identified database for analysis.

Data Analysis

A hierarchical multiple regression examined the variance in Exercise Adherence that could be predicted by a model with SOC (Step 1), adding SDT-RAI (Step 2), and including SEE and OEE (Step 3). Exercise Adherence was defined as the total summed visits to the gym over the 12 week period, categorised into Block Adherence for weeks 1 to 6 (Block 1) and for weeks 7 to 12 (Block 2).

As the only significant predictor in the regression model, SOC was the sole variable tested in follow-on exploratory analyses. These analyses examined mean

differences in Exercise Adherence between Baseline SOC categories using a one-way Analysis of Variance (ANOVA). Post hoc comparisons were made using Tukey's Honestly Significant Difference (HSD). The limited power for this analysis is duly noted along with the acknowledgement that insufficient data and associated loss of power, prevented follow-on analysis of Time 2 and Time 3 SOC category.

For the hierarchical multiple regression analysis, effect size estimates for Cohen's f^2 and 95% confidence intervals were calculated using the equation

$$f^2 = \frac{R^2_{AB} - R^2_A}{1 - R^2_{AB}} \text{ (Cohen, 1992), where } R^2_A = \text{variance accounted for by model 1, and}$$

R^2_{AB} = combined variance accounted for by model 2; values of .02, .15 and .35 were interpreted as small, medium and large effects respectively (Cohen, 1992). One-way ANOVA effect sizes were estimated using partial eta squared; values of .01, .09 and .25 were interpreted to mean small, medium and large effects (Field, 2013). Lambda (the Goodman-Kruskal index of predictive association), was calculated; values ranged from 0 = no association to 1 = perfect association, with positive and negative values indicative of the predictive direction of the association (Goodman & Kruskal, 1954).

An *a priori* power analysis was conducted to ascertain the necessary sample size for statistical tests. The current study required eight participants per predictor variable with an additional 50 participants according to the formula, $N > 50 + 8m$, where m = number of independent variables (Tabachnick & Fidell, 2013); as such a minimum sample of 82 was required to sufficiently power analyses (Tabachnick & Fidell, 2013). Unfortunately, despite precautionary measures taken to ensure expectations of this size were realistic, an adequately powered sample was not recruited. When the three gyms initially accepted the invitation to participate, accumulative membership sales from June-July 2014 were requested to estimate

participant numbers. These numbers quoted over 1,000 new memberships across all facilities, and justified researcher sample expectation of $n = 100$. However, when the design was operationalised, this did not realise. The Baseline sample almost halved for Time 2 ($n = 31$) and Time 3 ($n = 31$), which eliminated the possibility of testing mixed effects models due to a large number of empty cells and associated loss of power.

All data was analysed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., 2013). An alpha-level of .05 was used for all analyses.

Results

Data Cleaning

Prior to analysis, data was screened for accuracy and inflated/deflated correlations (Tabachnick & Fidell, 2013). Cases with missing data at Time 2 ($n = 28$) or Time 3 ($n = 34$) were retained for Baseline analyses ($n = 59$) to maximise available power for the multiple regression (Field, 2013). Two participants were removed from the final data set as they did not appropriately engage with the task and so their results were uninterpretable. At baseline, less than 1% of cases had standardised residuals greater than 2.58, indicating that no data points sat 3 standard deviations above the group mean, thus there were no outliers (Tabachnick & Fidell, 2013). Examination of Cook's distance revealed no influential data points with all values < 1 (Cook & Weisberg, 1982). Prior to conducting analyses, the data was checked for normality, linearity, multicollinearity and homoscedasticity in order to meet the statistical assumptions for hierarchical multiple regression.

Tests of normality demonstrated no evidence of significant skewness amongst predictor variables with all values < 1.0 (Tabachnick & Fidell, 2013). SOC and SEE however demonstrated excessive positive kurtosis with values exceeding

1.0 (Appendix K). Consequently, bootstrapping was performed on all analyses using 95% bias corrected and accelerated (BCa) confidence intervals, based on 1000 bootstrap samples, following recommendations by Field (2013), to reduce the impact of bias within the sample. Visual testing of standardised residuals histograms and normal probability plots demonstrated normally distributed error terms (Appendix L). Visual testing of residual scatterplots confirmed that linearity and homoscedasticity assumptions were met (Appendix M).

Variance Inflation Factors (VIF) and tolerance values showed no evidence of multicollinearity among variables as no VIF values exceeded 10 and all tolerance values were $>.10$ (Tabachnick & Fidell, 2013). All observations were independent and demonstrated non-zero variance. Finally a Durbin-Watson test indicated independent errors with a value around 2 (1.999) demonstrating little to no correlation between residuals (Field, 2013).

Predicting Exercise Adherence at Baseline

A hierarchical multiple regression tested three models for predicting exercise adherence from participant SOC, SDT-RAI, SEE and OEE scores at Baseline. At Step 1 SOC was entered into the model. At Step 2 SDT-RAI was added and at Step 3 SEE and OEE were added. Intercorrelations between the multiple regression variables are outlined in Table 1 and the hierarchical multiple regression statistics are reported in Table 2 (Field, 2013), Baseline descriptive statistics were also gathered for all four variables (Appendix N.).

Table 1

Summary of Intercorrelations between Predictor Variables in Hierarchical Multiple Regression

Variable	1	2	3	4
1. SOC	-			
2. SDT-RAI	.34**	-		
3. SEE	.23*	-.49***	-	
4. OEE	-.32**	-.43***	-.31*	-

Note. $N = 59$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2

Hierarchical Multiple Regression Analysis Predicting Exercise Adherence from Stage of Change, Self-Determination, Self-Efficacy & Outcome Expectancy

Variable	ΔR^2	β	B	$SE B$	BCa 95% CI for B
Step 1	.351***				
Constant			-12.32*	4.96	[-20.95, -2.10]
SOC		-.592***	7.86**	1.41	[5.05, 10.68]
Step 2	.002				
Constant			-12.49*	5.21	[-22.93, -2.04]
SOC		.609***	8.02**	1.51	[5.00, 11.04]
SDT-RAI		-.049	-.11	.35	[-.80, .59]
Step 3	.005				
Constant			-15.53	18.32	[-52.27, 21.21]

SOC	.623***	8.22**	1.56	[5.09, 11.36]
SDT-RAI	-.007	.02	.41	[-.80, .85]
SEE	-.050	-.13	.36	[-.85, .59]
OEE	.054	1.90	3.84	[-5.79, 9.60]

Total R^2

= .59***.

Note. $N = 59$. BCa 95% CI = Bias Corrected and Accelerated 95% Confidence Interval. Confidence Intervals and Standard Errors are based on 1000 bootstrap samples.

* $p < .05$. ** $p < .01$. *** $p < .001$.

The hierarchical multiple regression showed that Baseline SOC had a significant ($p < .001$) zero-order correlation with Exercise Adherence. In model 1, SOC had a large significant effect in the regression model* ($f^2 = .55$, $p < .001$), accounting for 35% of explained variance in Exercise Adherence. This regression model was significant $F(1, 57) = 31.30$, $p < .001$, $R^2 = .35$, 95% CI [5.05, 10.68]. The regression coefficient demonstrated that SOC was significantly different from zero ($\beta = .595$, $p < .001$), such that contemplation and preparation stage thinkers recorded lower total gym attendance than action and maintenance stage thinkers. This result shows that for each one standard deviation increase in SOC, there was an associated .59 standard deviation increase in Exercise Adherence.

Adding SDT-RAI to the model accounted for 35.3% of variance in Exercise Adherence, which was significant, $F(2, 56) = 15.43$, $p < .001$, $R^2 = .35$. However, there was no interpretable effect attributable to the addition of SDT in the regression model ($f^2 = .003$). As such, the additional amount of variance explained by SDT-RAI

* Due to low power this effect size is interpreted as strictly applying to the sample and is limited in its generalisability to the population.

was not significant to the final model as indicated by non-significant changes in R^2 and F for model 2, $F_{change}(1, 56) = .098, p = .756, \Delta R^2 = .001, 95\% \text{ CI } [5.00, 11.04]$. This result suggests that SDT-RAI was not significant in assisting the predictive capacity of SOC on Exercise Adherence.

When SEE and OEE were introduced into the final regression model (Step 3), this model accounted for 35.7% of the variance in Exercise Adherence, which was significant, $F(4, 54) = 7.61, p < .001, R^2 = .36$. However, there was no interpretable effect attributed to the addition of SEE and OEE in the regression model ($f^2 = .006$). As in the case of model 2, the additional explained variance did not significantly contribute to the model's predictive capacity of Exercise Adherence, as the change in R^2 and F were not significant, $F_{change}(2, 54) = .212, p = .809, \Delta R^2 = .005, 95\% \text{ CI } [-52.26, 21.21]$. Therefore, SEE and OEE did not significantly assist the predictive capacity of SOC on Exercise Adherence.

In summary, the hierarchical regression analysis indicated that the most important predictor of overall Exercise Adherence was SOC, because, when all four predictor variables were included in Step 3 of the regression model, neither SDT-RAI, SEE nor OEE could account for an additional amount in variance of Exercise Adherence than that explained by SOC. Accordingly, the three latter variables were excluded from follow on analyses.

Determining Exercise Adherence in Stage of Change Categories

A one-way between-subjects ANOVA was run to determine where mean differences lay in Exercise Adherence on Baseline (BL) SOC category. The ANOVA yielded a significant variation among Exercise Adherence for BL SOC, $F(3, 55) = 11.76, p < .001$. SOC category had a large significant effect on total Exercise

Adherence ($\eta^2 = .64, p < .001$)*. Descriptive statistics indicated that the average Exercise Adherence was significantly lower for participants in the contemplation ($M = 4.89, SD = 5.92$), 95% CI [2.57, 7.43] and preparation ($M = 6.25, SD = 12.21$), 95% CI [1.85, 13.24] at Baseline, compare to participants in the action ($M = 22.74, SD = 12.46$), 95% CI [17.65, 28.10] and maintenance ($M = 25.20, SD = 15.58$), 95% CI [16.00, 33.80]. This result suggests that people in higher BL SOC categories display higher Exercise Adherence over time.

This result was tested for Baseline SOC category on Block 1 and Block 2 Exercise Adherence in follow on analyses. Two one-way ANOVAs were run for BL SOC x Block 1 and BL SOC x Block 2, respectively. As the assumption of homogeneity of variance was violated for the Block 1 (Levene Statistic = 2.90, $p = .04$) and for the Block 2 (Levene Statistic = 2.91, $p = .04$) ANOVA, a Welch's adjusted F ratio was used. The ANOVA for Block 1 demonstrated a significant effect of BL SOC category on Block 1 Adherence, $F(3, 55) = 15.54, p < .001$. The ANOVA for Block 2 was also significant, $F(3, 55) = 7.39, p = .001$. Tukey HSD post hoc comparisons showed contemplation and preparation yielded significantly lower total Block Adherence than action and maintenance. Post hoc comparisons are summarised in Table 3.

* Due to low power this effect size is interpreted as strictly applying to the sample and is limited in its generalisability to the population.

Table 3

Tukey HSD Comparison for Block 1 and Block 2 Exercise Adherence

		<i>BCa 95% CI for</i>				
		(I)	(J)		<i>Exercise Adherence</i>	
Block	SOC	SOC	<i>M Diff</i>	<i>SE</i>	<i>Lower</i>	<i>Upper</i>
			(I-J)		<i>Bound</i>	<i>Bound</i>
Block 1	Contemplation	Action	9.23*	1.77	4.53	13.92
		Maintenance	9.98*	2.13	4.34	15.61
	Preparation	Action	9.45*	1.99	4.18	14.72
		Maintenance	10.20*	2.31	4.08	16.32
Block 2	Contemplation	Action	8.62*	2.31	2.52	14.73
		Maintenance	10.13*	2.76	2.81	17.46
	Preparation	Action	6.87*	2.58	.03	13.72
		Maintenance	8.38*	3.00	.43	16.33

Note. $N = 59$. SOC = Stage of Change. *M Diff* = Mean Difference. *SE* = Standard Error. BCa 95% CI = Bias Corrected and Accelerated 95% Confidence Interval. Confidence Intervals and Standard Errors are based on 1000 bootstrap samples.

* $p < .05$.

Examining Trends in Stage of Change Transition and the Trajectory of Adherence

The last stage of analyses sought to test the final research aim, namely whether the impact of SOC on Exercise Adherence held up in terms of the directional change between these two variables over time. In order to examine the trajectory of adherence, the Exercise Adherence variable was categorically reclassified to direction of Block 1-Block 2 (B1-B2) Adherence (Same, Increased in

Block 2, Decreased in Block 2). Two separate chi-square tests of independence calculated the strength of the following relationships:

Test 1. T2 SOC (Contemplation, Preparation, Action, Maintenance) x B1-B2

Adherence (Same, Increased in Block 2, Decreased in Block 2).

Test 2. T3 SOC (Contemplation, Action, Maintenance)* x B1-B2 Adherence

(Same, Increased in Block 2, Decreased in Block 2).

The chi-square tests showed no significant relationship between variables for Test 1, $X^2(8, N = 31) = 13.34, p = .183$. This result indicated that there was no difference in the likelihood that participants in contemplation, preparation, action and maintenance at T2 would stay the same, increase or decrease in B1-B2 Adherence. However, the results for the chi-square for Test 2 were significant, $X^2(4, N = 31) = 22.17, p < .001$. This result demonstrated that all the participants who decreased in Block 2 Adherence were in the contemplation stage (100%) at T3; that the proportion of the participants who increased in Block 2 Adherence was greater for T3 action (33.3%) and T3 maintenance (58.3%) stages than for the T3 contemplation stage (8.3%). Finally, all the participants who stayed the same in Adherence in Block 2 were in T3 maintenance (100%). A visual representation of Test 2 is shown in Figure 3.

* There were no recorded precontemplation or preparation stage participants in T3 SOC.

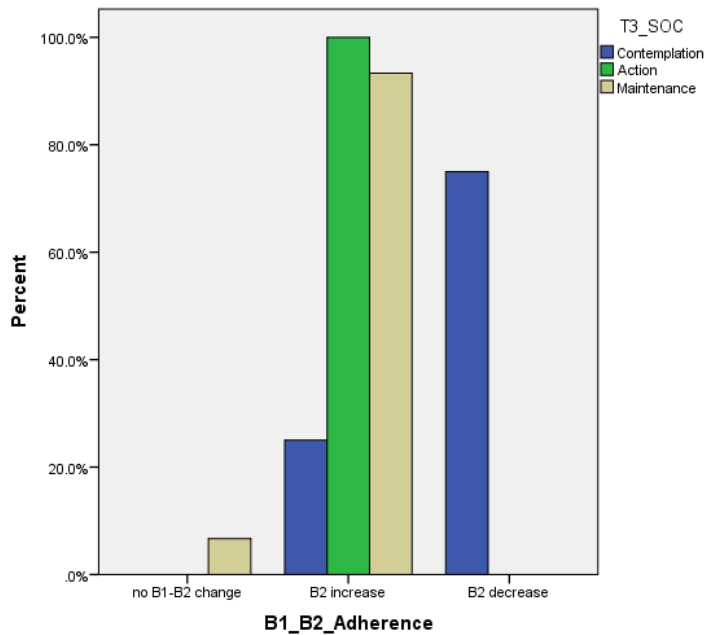


Figure 3. Relationship between Time 3 Stage of Change and Block 1 to Block 2 Direction of Exercise Adherence

To determine whether the difference in trajectory of Adherence was associated with transition in SOC category, Baseline to Time 2 (BL-T2) and Time 2 to Time 3 (T2-T3) SOC were categorically reclassified into a variable of stage transition (Stayed in stage, Progressed, Regressed). Two lambda cross-tabulation tests of association were performed to examine the strength and direction of the following relationships:

Test 3. BL-T2 SOC (Stayed, Progressed, Regressed) x B1-B2 Adherence (Same, Increased in Block 2, Decreased in Block 2).

Test 4. T2-T3 SOC (Stayed, Progressed, Regressed) x B1-B2 Adherence (Same, Increased in Block 2, Decreased in Block 2).

Lambda was not significant for Test 3, $\lambda = .08$, $p = .31$, indicating no significant association between those who stayed, progressed or regressed in BL-T2 SOC and staying the same, increasing or decreasing in Block 2 Adherence. The lambda result for Test 4 however was significant, $\lambda = .46$, $p = .02$. This analysis

showed that there was a significant strong association between T2-T3 SOC and participant B1-B2 Adherence, in that information about T2-T3 SOC assisted in improving the prediction of the trajectory of Adherence by 71.4%. Lambda demonstrated that those participants who stayed (54.2%) or progressed (41.7%) in T2-T3 SOC were more likely to increase in Block 2 Adherence than those who regressed (4.2%); that all participants who decreased in Block 2 Adherence also regressed in T2-T3 SOC (100%); and finally that all participants who stayed the same in Block 2 Adherence also stayed in T2-T3 SOC (100%).

It must be acknowledged that for all lambda cross tabulation rows (T2-T3 SOC), column percentage differences were $>5\%$. This suggests that, despite showing a significant strong association, lambda may be understating the strength of the relationship between column variables (B1-B2 Adherence) (Appendix O; Makuch, Rosenberg, & Scott, 1989). Additionally for both lambda and chi-squares, only 31 data points were available for testing, which resulted in some cells containing one observed count. This may have impacted on the power and strength of results, so in terms of generalisability, results must be considered with caution. A visual representation of Test 4 is shown in Figure 4.

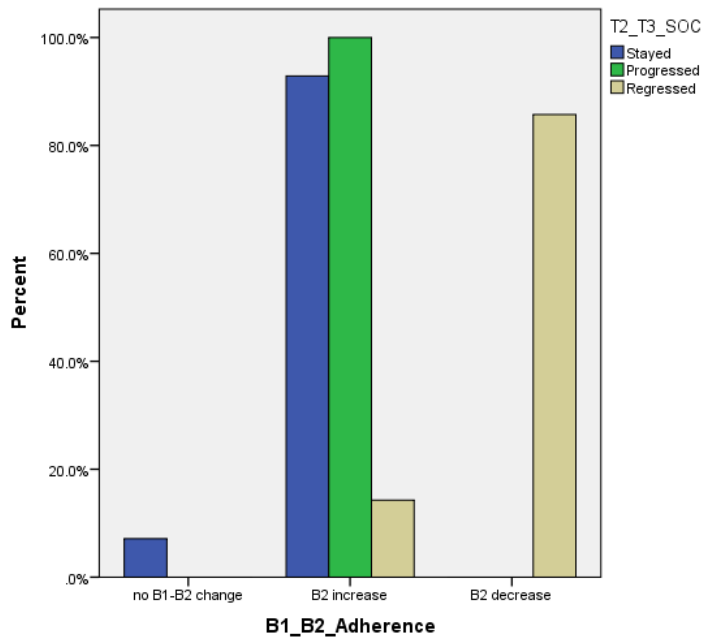


Figure 4. Association between Time 2 to Time 3 Stage of Change Transition and Block 1 to Block 2 Direction of Exercise Adherence

Discussion

The aims of the current study were to:

1a) examine the capacity of Stage of Change (SOC), Self-Determination Theory – Relative Autonomy Index (SDT-RAI), Self-Efficacy for Exercise (SEE) and Outcome Expectancy of Exercise (OEE) to predict Exercise Adherence

1b) test whether change in the predictor variables related to the trajectory in Exercise Adherence over time; and

2) Determine whether previous research findings, which suggest higher SOC, autonomous SDT, high SEE and positive OEE, facilitate greater Exercise Adherence, generalised to the free-choice adherence of a community sample.

Predicting Exercise Adherence

The current study tested a hierarchical regression model to predict Exercise Adherence. The results lend support to SOC in Hypothesis 1, as the greatest predictor. The regression model showed that SOC accounted for a significant 35%

variance in Exercise Adherence. This result suggests that higher stages of change enable the individual to progress away from contemplating exercise behaviours and towards permanently implementing them, which is consistent with previous literature (Bredahl et al., 2011; Daley & Duda, 2006; Prochaska & Marcus, 1994).

Contrary to the existing literature (King, 2001; Puente & Anshel, 2010; Sniehotta et al., 2005), the results of the current study did not lend support to SDT-RAI, SEE or OEE as predictors of Exercise Adherence. In the final regression model, all variables could only explain an additional .5% of variance. These results did not support the contribution of SDT-RAI, SEE and OEE to Hypothesis 1 or support their independent hypotheses respectively (Hypothesis 3 and Hypothesis 4). In the case of regression analysis, the limited power of the sample did not justify the reduced variable effects, as there was no interpretable effect size attributable to the addition of SDT-RAI ($f^2 = .003$), or of SEE and OEE ($f^2 = .006$). This suggests that even if the regression analysis had been sufficiently powered by a larger sample, the results would still have demonstrated little to no effect for these variables to predict gym attendance. Therefore, it can be generalised that these variables have no interpretable effect in predicting gym attendance in community populations.

These findings offer insight into the determinants of exercise in community populations. For self-determination, it appears that the type of autonomous or controlled motivation, reported upon initiating exercise, does not significantly impact how often the individual will exercise over time as suggested by theory (Deci & Ryan, 2000). Rather, there is little variance in the level of exercise that can be attributed to differences between controlled and autonomous motivation. For self-efficacy, the results show that an individual's belief about their confidence and capacity to exercise does not relate to their consequent level of adherence. This

finding contradicts previous evidence (Bandura, 1986; Sniehotta et al., 2005).

Further, in relation to outcome expectancy, the results of the current study demonstrate that perceived exercise outcomes do not seemingly relate to level of exercise adherence; again contrary to presented theory (Garcia & Mann, 2003; King, 2001; Williams et al., 2005). Thus, in terms of SDT-RAI, SEE and OEE, the available theory and research do not explain why these variables were unsupported for the exercise engagement of a community sample.

Stage of Change

Stage of change presents five cognitive stages that an individual will experience in implementing an adaptive health behaviour (Prochaska & Marcus, 1994). Established evidence on exercise showed that stage progression sequentially facilitated greater engagement in physical activity (Bredahl et al., 2011; Daley & Duda, 2006). The current study examined the effect of Baseline stage category on Exercise Adherence. One-way ANOVA results showed that participants in maintenance had higher total mean gym attendance than participants in action; these stages in turn had significantly higher mean attendance than the lower stages. In the lower stages, preparation had higher mean attendance than contemplation.

Proceeding one-way ANOVAs showed this difference carried down to Block 1 and Block 2 with maintenance and action having significantly higher mean attendance than preparation and contemplation in both blocks. These results supported Hypothesis 2 and were consistent with previous research (Bredahl et al., 2011; Daley & Duda, 2006). Therefore, it appears that the higher up the stage ladder a person progresses, the more they will engage and commit to exercise.

In the final phase of analysis, the current study tested the relationship between transition in SOC and the trajectory of Exercise Adherence. Chi-square

results displayed a significant relationship between Time 3 SOC and the trajectory of Adherence. This result indicated that at Time 3 participants who decreased in attendance between Block 1 and Block 2 were most often in the contemplation stage, participants who increased in attendance were most frequently in the action or maintenance stages, and participants who stayed the same were most often in the maintenance stage. This result aligns with theory as contemplation is characterised by cognitive ambivalence and not by behavioural engagement (Bredahl et al., 2011), whereas action and maintenance both involve the repeated actioning of exercise (Daley & Duda, 2006).

Lambda cross tabulations tested the proportional reduction in error in predicting the trajectory of adherence from transition in SOC between Time 2 and Time 3. Results showed that prediction of the trajectory of adherence was significantly improved (71%) by having information of participant SOC transition. This verified the bidirectional relationship between the variables, as progressing in SOC increased the likelihood of more frequent gym attendance, regressing in SOC increased the likelihood of decreasing in attendance, and remaining in stage most often resulted in the same level of attendance. Both the chi-square for Time 3 SOC and lambda findings lend support to Hypothesis 5 and are consistent with stage of change theory (Prochaska & Marcus, 1994).

Chi-square tests for Baseline and Time 2 SOC showed no significant relationship with the trajectory of adherence. Additionally, lambda indicated no significant association between Baseline and Time 2 transition in SOC and the trajectory of adherence. These findings require a deliberation of transtheoretical theory to explain conflicting results in the current study. According to the transtheoretical model, the transition between stages is dynamic and unstable, as the

individual must process the necessary cognitions to progress to the next stage (Prochaska & Marcus, 1994). Time, however, acts as an agent of cognitive and behavioural stability once an individual reaches action and maintenance (Daley & Duda, 2006). This point refers to the consistent engagement in exercise required in the action stage to progress to maintenance, where the accumulation of time facilitates stabilisation of behaviour taking root so no longer being perceived as change (Prochaska & Marcus, 1994).

When applied to the current study, Baseline SOC recorded the most unstable data, as participants had not yet engaged in exercise for long enough for cognitions and behaviours to stabilise. By Time 3 data collection, however, the participants had had the opportunity to consider exercising (contemplation/preparation) or actually exercise (action/maintenance) at the gym for three months. Accordingly, their stage transition was relatively more stable than when they started and, measures taken at this time facilitated more accurate post-dated prediction of the trajectory of adherence. Therefore, consistent with theory (Prochaska & Marcus, 1994), the Time 3 SOC suitably referenced the past, and appropriately predicted the future behaviour of the sample. These findings suggest that stage of change theory becomes more predictive of the trajectory of free-choice gym attendance in community populations as time progresses. Therefore, the most accurate testing of bidirectional prediction would be run six months after the Baseline measures, at a minimum.

Explaining Non-Adherence

Self-efficacy and outcome expectancy were introduced into the current study as standard constructs within health psychology literature; these have been consistently referenced as constructs relating to health behaviour engagement (Garcia & Mann, 2003; Trost et al., 2002). However, the results of the current study

suggest that other variables may better serve the study of Exercise Adherence in community populations, to possibly explain variance that SEE and OEE could not. For the sample in the current study, this finding was also the case for SDT-RAI, despite the reviewed literature presenting empirically successful predictions of exercise with this construct. Why these results unsupported the theories in the current study requires consideration.

As addressed in the introduction of the current study, the available up-to-date research on OEE and SEE was primarily theoretical. For SDT-RAI the findings yielded by established research were unfocused and inconsistent in their measurement of exercise adherence. Such measurement varied from ‘turning up on the day’ (Puente & Anshel, 2010), to measuring usual training routines (Pelletier et al., 2001), to engaging in a structured supervised exercise program (Williams et al., 2005). In these referenced studies, none of the sample participants were engaging in exercise with the expectation that behaviour was “free-choice”. Rather the researchers supervised the exercise class (Puente & Anshel, 2010), trainers monitored participant activity (Pelletier et al., 2001) or trainers instructed participants through their workout (Williams et al., 2005). In contrast, the current study left the definition of adherence in the hands of its sample, as each participant went to the gym if ever and whenever they wanted to. The difference between the literature review and the current study therefore suggests one of three possible outcomes.

Firstly, the researchers of specialised population samples may have presented exercise adherence in an incentivised or mandatory light. For example, the sample of university participants were required to attend the exercise class as a course requirement, which could have been perceived as mandatory (Puente & Anshel,

2010). In Pelletier et al.'s study (2001), the athletes were expected to attend training sessions and the training sessions themselves acted as a personalised incentive of athletic development. This subtle and indirect manipulation could have had an impact on the effect of SDT-RAI on adherence. This is not to say the current study did not impose some influence on its sample; participants were offered the chance to win a free month of membership if they completed all three data collections. However, this incentive differed from previous research (Pelletier et al., 2001; Puente & Anshel, 2010) as it was not directed towards exercise adherence, only towards the contribution of predictor variable data.

The second possible outcome relates to the construct validity of "free-choice" exercise in the current study, as attendance data was collected indirectly. This decision may have impacted on the success of SDT-RAI, SEE and OEE in predicting adherence in this sample. Standard protocols within all three facilities saw new members provided with cards that were scanned upon arrival to the gym. This process meant that all gym members, regardless of whether they were sample participants or not, were treated in the same way whilst in the gym environment. The number of scans for each participant (as requested through obtained informed consent) was exported as data at the end of the 12 weeks. This outcome suggests that something about the choice to exercise permitted in the current study reduced the effects of SDT-RAI, SEE and OEE on exercise adherence when compared to the participants of a specialised, more controlled sample and related theory.

The third possible outcome concerns the fact that the reviewed theories on self-determination, self-efficacy and outcome expectancy were written about and modelled on fitness behaviours. Despite this, these theories were unable to explain a behavioural pattern presented by the current sample; participants purchased gym

memberships and contributed to predictor data but did not go to the gym. Therefore, given that theories of exercise behaviour gave no appropriate explanation, it is reasonable to suggest that this behaviour did not relate to fitness. If this is the case, alternative theories that explain consumer behaviours may account for unaddressed participant behaviour in the current study.

Overconfidence Agents

The first of these alternative theories concerns overconfidence agents. Polivy and Herman (2004) suggest that individuals will attach themselves to goals that are not subjectively realistic and will inevitably fail. Overconfidence agents fuel false hope for attaining such goals and are distinct from optimism or realistic confidence as they are not conducive to success (Armor & Taylor, 1998). It has been demonstrated within empirical literature that consumers of the fitness industry overestimate their future efficiency in exercising (DellaVigna & Malmendier, 2002). This overconfidence causes consumers to deviate from their optimal contractual choice when signing up to the gym (DellaVigna & Malmendier, 2006). Rather than opting for a casual membership to trial exercise, consumers were more likely sign up for 6 or 12 month contracts and payments would be debited monthly, without them using gym facilities (DellaVigna & Malmendier, 2002). Whilst intention, motivation and self-efficacy beliefs prior to engaging in exercise were high, these cognitions fell away when exercise behaviours were actioned (DellaVigna & Malmendier, 2006). These studies further showed that inferring that consumers who signed yearly or half yearly contracts would exercise regularly, grossly overestimated their actual attendance (DellaVigna & Malmendier, 2006).

The behavioural pattern described by overconfidence agents appears to exist in the current sample; 54% of participants attended the gym less than once a week on

average ($n = 32$) and within that cohort, 28% attended once, or not at all ($n = 9$). This percentage appears prevalent within the fitness industry itself. Research of a popular chain of American gyms showed each franchise averaged 6,500 memberships, of which only 300 members regularly attended (averaging 1.7 visits per week) (Garon, Masse, & Michaud, 2013). Therefore, while these consumers were intending to exercise, and set themselves up to do so, they did not convert this thought into maintainable action. Whilst overconfidence agents describe the behavioural tendency behind non-adherence, there is still the need to explain the cognitions that pre-empt such behaviours. On this note, self-identity theory might offer insight.

Self-Identity Theory

Self-identity theory argues that the core of consumer purchasing concerns the congruence between self-identity (how the individual actually perceives him or herself) and desired self-concept (the label by which the individual desires to be perceived) (Escalas et al., 2013; Sirgy, 1982). These desired labels direct purchasing behaviours towards maintaining and enhancing the self-concept (Escalas et al., 2013; Mittal, 2015; Sirgy, 1982). Within the context of fitness consumer behaviour, this essentially equates to purchasing perceptions of being fit and healthy. By purchasing a gym membership, the consumer will assume that others will perceive them as frequenting the gym, and by association being physically fit (Mittal, 2015). Furthermore, the individual themselves will adopt this perception of increased fitness. In self-identity theory, whether or not exercise engagement actually occurs is, in part, irrelevant (Mittal, 2015). The consumer will often maintain congruence by purchasing products that complement the label; buying new trainers or branded active wear to look and feel fitter (Escalas et al., 2013; Mittal, 2015). In self-identity theory, perception does not need to equate to action to achieve a positive outcome for

the individual. Rather, by enhancing the self-concept to reflect the desired label the individual will be satisfied (Sirgy, 1982; Mittal, 2015).

Within the current study, there were cases of sample participants engaging in all data collection times and reporting that they were consistently maintaining exercise ($n = 3$). However, when attendance data was collated, these participants had not adhered as stated. Considering this circumstance in the framework of self-identity theory, these individuals experienced incongruence between their current and ideal self, and, consequently, signed up to the gym and reported exercise behaviour to the researchers in order to perceive themselves, and be perceived by others as fit.

Further Investigation

The results of the current study support stage of change theory in a community sample. This study has demonstrated that continuing research is required to investigate community samples over convenience or specialised sampling, as community members display behaviours that are not found in specialised populations. In relation to these novel behavioural patterns, future research would benefit from considering a more exhaustive list of predictors, from both consumer and exercise behavioural theory, to appropriately study exercise in the community. Additionally, longitudinal designs are necessary for a developed understanding of how changes in such variables equate to changes in exercise over time.

The community sample provided results that were inconsistent with self-determination, self-efficacy and outcome expectancy theory. Given the established value in studying community samples, it would be pertinent for future research to test SDT-RAI, SEE and OEE on alternative types of free-choice exercise, because, consumer behaviour associated with gym exercise may have obstructed the effects of

these variables in the current study. Removing the specification of gym exercise may enable empirical support to the theory of these predictors in a community context.

It has been well established in the current study that behavioural patterns existed in the community sample that were not addressed in theory. This finding has an important implication on the applicability of past research. Health appeals are developed from health literature and research of health behaviours. Such appeals target health behaviours in community members. Without studying the population which will be most impacted by the research, the related theories will be kept to explaining only behaviours demonstrated by a particular cohort. Community populations must be used, therefore, to optimise the scope of knowledge and the reference points from which health appeals are introduced into the community.

Limitations

The current study suffered from five major limitations:

1) The unexpected collapse of numbers for the research sample. Consequent restrictions in power prevented mixed effects models to be tested. This analysis would have more appropriately examined stage of change transition and the trajectory of adherence, by calculating the change in week as opposed to Block adherence;

2) The sub-optimal measurement of SOC. The theoretically dynamic nature of stage transition would have been better served if SOC was measured weekly to pinpoint stage movements (Prochaska & Marcus, 1994). Additionally, the investigation of stage transition over 6 months would have been optimal (Prochaska & Marcus, 1994), but was impractical within the time constraints of this research;

3) The measurement of the outcome variable. Only a particular facet of exercise was measured and participants could have engaged in other physical

activities. Further, records showed that participants entered the gym, not that their activity met the moderate to high intensity output needed to qualify as exercise (AIHW, 2014). Although this was also the case in empirical study (Pelletier et al., 2001; Puente & Anshel, 2010; Sniehotta et al., 2005), it was not ideal for operationalising the construct;

4) The representativeness of the sample. Whilst the sample consisted of community members, two of the gyms were located on university campuses. This meant an overrepresentation of students ($n = 41$) in the final sample;

5) The large proportion of unexplained variance. Whilst the available literature did not account for this variance in the sample, it may have been pertinent to consider a more exhaustive list of predictor variables.

Despite these limitations the current study has several strengths. The current study demonstrated support for stage of change theory. The current study introduced alternative constructs that may exist in community, but not in specialised, populations which can inform exercise behaviour. Finally, the current study indicated the necessity of testing community samples, as the data of community members does not parallel the data of specialised populations.

Conclusion

The current study provided evidence that stage of change significantly predicts the free-choice exercise adherence of a community sample. This is consistent with theory. This research confirmed the bidirectional relationship between stage transition and the subsequent trajectory of exercise over time. However, with reference to self-determination theory, self-efficacy and outcome expectancy, the results challenged the respective theories when tested in a community sample. Exploring behaviours that impact on free-choice exercise in the

community appears warranted as such findings have an important implications for health research. Health appeals are developed within the scope of theory and empirical research; therefore the theory must study the community members on which later appeals hope to affect. The focus on community sampling is therefore essential to confirm that the theory informs behaviours displayed by associated populations. The current study confirmed the empirical value of investigating predictors of free-choice exercise in the community and offered caution to the interpretation and reliance on the existing theory behind exercise behaviour.

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Appendices

Appendix A

Email to Gym Managers

To Whom It May Concern,

My Name is Leia Giacon and I am a Behavioural Science honours student, at the University of Tasmania. I am currently developing a research design for my honours thesis, under the supervision of Peter Tranent. My research aims to investigate the predictors of regular, long-term exercise by examining how and why people are driven to exercise, and whether these factors vary for an individual or between people over time.

This research depends on the completion of an online questionnaire three times during the 12 week research period (July-September 2015): during new members' 1st week, 6th week and 12th week at the gym. Participants will also be asked to provide demographic information regarding their age, sex, profession, training preference and current exercise status (i.e. have they moved from another fitness facility or are they engaging in exercise for the first time).

I am seeking your permission to recruit participants for this study at your gym with the help of reception staff at your fitness facility. I ask for your co-operation in advertising via promotional posters along with your reception staff giving verbal invitations to new members between June and July 2015. The research also requires the attendance records of participants for the 12 weeks.

I will endeavour to keep the any demands on the time of your staff to a minimum. The involvement of your facility is completely voluntary and you are able to withdraw your facility from the research at any time, I will be happy to answer any and all questions you may have throughout the duration of the research.

I will be happy to share the findings of my research with your facility and members upon the completion of my thesis and hopefully provide you with information that is interesting and useful to your facility and members alike. I will contact you over the next week to further discuss this research and your potential involvement.

Thank you for your time and consideration of this matter.

Kind Regards,

Leia Giacon.

Honours Student, University of Tasmania

0408 372 787

leia.giacon@utas.edu.au

Appendix B

Baseline Gym Recruitment Poster

RESEARCH PARTICIPATION RECRUITMENT



Ever wondered what makes you go to the gym and why???

Are you signing up as a **first time** gym member?
 Have you **moved** from another gym recently?
 Do you plan on exercising for the next **3 months**?
 Want to win a **free one-month** membership?...

Then we want you!!!

We invite you to participate in research about the motivational and cognitive factors underlying exercise. Participants will complete 4 online questionnaires in 3 different weeks over the next 3-months:
29th June - 7th July, 3rd - 9th August, 21st - 28th September
 This information will tell us about your motivation and attitude towards exercise, allowing us to determine which motivation and thought state predicts the highest level of exercise adherence.

All participants who complete **all three survey weeks** will go into the draw to win a **free one-month membership** on us.

Please take a business card for more information **OR:**
 call: **0408 372 787** email: **leia.giacon@utas.edu.au**
 or visit: **<https://surveys.utas.edu.au/index.php/678922/lang-en>**

Appendix C

Baseline Participant Demographics

Category	Subcategory	<i>n</i>	%	<i>M</i>	<i>SD</i>
Age		59		27.69	11.15
	18-25	38	64.4		
	> 25	21	35.6		
Gender	Female	38	64.4		
	Male	21	35.6		
Profession	Student	41	69.5		
	Other	18	30.5		
Gym	Gym 01	41	69.5		
	Gym 02	8	13.6		
	Gym 03	10	16.9		
Exercise	New to Gym Exercise	24	40.7		
Status	Moved from another Gym	12	20.3		
	Went to the Gym (over 6mths ago)	23	39.0		
Exercise	Group Exercise	28	47.5		
Preference	Free Weight/Machine Weights	15	25.4		
	Gym Floor Cardio Training	16	27.1		

Appendix D

Exercise Self-Regulation Questionnaire (SDT-RAI)

This questionnaire concerns the reasons why a person exercises regularly, does gymnastics, works out, or engages in other such physical activities. It is structured so that it asks one questions and provides responses that represent external regulation, introjected regulation, identified regulation, and intrinsic motivation. The basic issue concerns the degree to which one feels autonomous with respect to exercising or engaging in physical activity.

Motivation for Working Out

There are a variety of reasons why people work out. Please indicate how true each of these reason are for why you work out. The scale is:

1	2	3	4	5	6	7
not at all true			somewhat true			very true

Why do you work out?

1. Because I simply enjoy working out.
2. Because working out is important and
3. Because I would feel bad about myself if I didn't do it.
4. Because it is fun and interesting.
5. Because others like me better when I am in shape.
6. Because I'd be afraid of falling too far out of shape.
7. Because it helps my image.
8. Because it is personally important to me to work out.
9. Because I feel pressured to work out.
10. Because I have a strong value for being active and healthy.
11. For the pleasure of discovering and mastering new training techniques.
12. Because I want others to see me as physically fit.

Participant ID: _____

Date: _____

Appendix E

Exercise: Stage of Change Continuous Measure (SOC)

Please use the following definition of exercise when answering these questions:

Regular Exercise is any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) performed to increase physical fitness. Such activity should be performed 3 to 5 times per week for 20-60 minutes per session. Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat.

Please enter the number in the box that indicates how strongly you agree or disagree with the following statements:

1 = Strongly Disagree

2 = Disagree

3 = Undecided

4 = Agree

5 = Strongly Agree

1.	As far as I'm concerned, I don't need to exercise regularly.	
2.	I have been exercising regularly for a long time and I plan to continue.	
3.	I don't exercise and right now I don't care.	
4.	I am finally exercising regularly.	
5.	I have been successful at exercising regularly and I plan to continue.	
6.	I am satisfied with being a sedentary person.	
7.	I have been thinking that I might want to start exercising regularly.	
8.	I have started exercising regularly within the last 6 months.	
9.	I could exercise regularly, but I don't plan to.	
10.	Recently, I have started to exercise regularly.	
11.	I don't have the time or energy to exercise regularly right now.	

12.	I have started to exercise regularly, and I plan to continue.	
13.	I have been thinking about whether I will be able to exercise regularly.	
14.	I have set up a day and a time to start exercising regularly within the next few weeks.	
15.	I have managed to keep exercising regularly through the last 6 months.	
16.	I have been thinking that I may want to begin exercising regularly.	
17.	I have lined up with a friend to start exercising regularly within the next few weeks.	
18.	I have completed 6 months of regular exercise.	
19.	I know that regular exercise is worthwhile, but I don't have time for it in the near future.	
20.	I have been calling friends to find someone to start exercising within the next few weeks.	
21.	I think regular exercise is good, but I can't figure it into my schedule right now.	
22.	I really think I should work on getting started with a regular exercise program in the next 6 months.	
23.	I am preparing to start a regular exercise group in the next few weeks.	
24.	I am aware of the importance of regular exercise but I can't do it right now.	

Appendix F

The SCI Self-Efficacy for Exercise Questionnaire (SEE)

Please tell us how confident you are at carrying out regular physical activities.

I am confident...

1. ...that I could always overcome barriers and challenges with regard to exercise if I try hard enough.

☐

Not at all
true

☐

Hardly
true

☐

Moderately
true

☐

Exactly
true

2. ...that I could find the means and ways to exercise and be physically active.

☐

Not at all
true

☐

Hardly
true

☐

Moderately
true

☐

Exactly
true

3. ...that it is easy for me to accomplish my activity and exercise goals.

☐

Not at all
true

☐

Hardly
true

☐

Moderately
true

☐

Exactly
true

4. ...that when I am confronted with a barrier to exercise I could usually find several solutions to overcome this barrier.

☐

Not at all
true

☐

Hardly
true

☐

Moderately
true

☐

Exactly
true

5. ...I could exercise even when I am tired.

☐

Not at all
true

☐

Hardly
true

☐

Moderately
true

☐

Exactly
true

6. I could exercise even when I am feeling depressed.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not at all	Hardly	Moderately	Exactly
true	true	true	true

7. ...that I could exercise even without the support of my family or friends.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not at all	Hardly	Moderately	Exactly
true	true	true	true

8. ...that I could exercise without the help of an exercise therapist.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not at all	Hardly	Moderately	Exactly
true	true	true	true

9. ...that I could be physically active despite my spinal cord injury

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not at all	Hardly	Moderately	Exactly
true	true	true	true

10....that I could exercise even if I had no access to a gym or training facility.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not at all	Hardly	Moderately	Exactly
true	true	true	true

Appendix G

Outcome Expectancy for Exercise Questionnaire (OEE)

Below is a list of possible outcomes of participating in regular physical activity.

Please rate each question **twice**.

- Under the heading “**How Likely**”, please indicate *how likely it is that you* would experience each of the outcomes below.
- Under the heading “**How Important**”, please indicate *how much it would matter to you* if each of the outcomes below occurred.

Please choose one number from the following rating scale in each space.

Not at all likely	1	Not at all important
Somewhat likely	2	Somewhat important
Moderately likely	3	Moderately important
Very likely	4	Very important
Extremely likely	5	Extremely important

SAMPLE: If it is very likely that I will develop stronger muscles, but my muscle strength is not at all important to me (i.e. it doesn't matter at all to me) then I would answer like this:

	How likely	How important
1. I will build up muscle strength	4	2

	How likely	How important
1. I will build up muscle strength		
2. It will be too time-consuming		
3. I will feel less depressed and/or bored		
4. It will improve my self-esteem		
5. I will feel tired		

6. I will not be good at doing the exercise
7. It will take too long to achieve the outcomes I want
8. I will not enjoy it
9. I will feel less tension and stress
10. It will be too much work and effort to motivate myself to exercise
11. I will improve my health or reduce my risk of disease
12. I will do better on my job
13. I will feel physically uncomfortable while exercising (out of breath, stitch etc)
14. It will be difficult to find friends to do the activity with me
15. I will feel more attractive
16. I will improve my heart and lung fitness
17. It will cost too much money
18. I will find it boring
19. I will increase my energy level
20. I will improve my muscle tone
21. It will take away from the time I have to spend with my family
22. It will take away from the time I have for my work/school
23. I will feel better about my body
24. I will gain muscle
25. It will decrease the energy I have for other activities

Appendix H

Copy of Ethics Approval

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au



HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

Mr Peter Tranent
Psychology
Private Bag 1342

Sent via email

Dear Mr Tranent

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL

Ethics Ref: H0014926 - Examining the role of motivation and cognitive change as predictors of exercise adherence in community populations

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 11 May 2015.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.
3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.
5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**
6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Natasha Jones
Ethics Officer
Tasmania Social Sciences HREC



Appendix I

Participant Information Sheet

PARTICIPANT INFORMATION SHEET BEHAVIOURAL SCIENCE/ PSYCHOLOGY RESEARCH

Examining the role of motivation and cognitive change as predictors of long-term exercise adherence in community populations

Invitation

You are invited to participate in a research study into exercise adherence. The study is being conducted by Leia Giacon, student, Faculty of Health, University of Tasmania, under the supervision of Peter Tranent. This study is being conducted in fulfilment of the requirements for the degree of Honours in Bachelor of Behaviour Science.

1. ‘What is the purpose of this study?’

The purpose of this study is to investigate the predictors of regular, long-term exercise by examining and understanding how and why people are driven to exercise, and whether these factors vary for an individual over time, or between people.

2. ‘Why have I been invited to participate in this study?’

You have been invited to participate in this study because you have approached a gym with the intent to exercise.

3. ‘What does this study involve?’

The study involves completing four questionnaires, called *The Exercise Self-Regulation Questionnaire*, *The Self-efficacy for Exercise Questionnaire*, *The Benefits of Physical Activity Scale* and the *Stages of Exercise Change Questionnaire*. The completion of the four tests will occur three times over your next three months of gym membership: in the first week you join the gym, within your 6th week of being a member and at the end of 3-months of membership. Completing the four tests will take about 30 minutes to complete. In your first completion session you will also provide demographic information (e.g. age, sex, profession and current exercise status). Your answers will be treated in confidence and the information provided will assist in understanding the underlying motivation and thought processes involved in long-term exercise adherence. During your 3-months of membership the gym will record every time you train in their facility and what type of training you do (e.g. fitness class or equipment use) to measure your adherence to free-choice exercise. It is important that you understand that your involvement in this study is completely voluntary. While I would be pleased to have you participate, I respect your right to

decline. There will be no consequences to you if you decide not to participate, and this will not affect your treatment or involvement at the gym. If you decide to discontinue participation at any time, you may do so without providing an explanation. All information will be treated in a confidential manner, and your name will not be used in any publication arising out of this research. All of the researched information will be kept in secure storage at the Division of Psychology, University of Tasmania and under password protected storage in a university server.

4. Are there any possible benefits from participation in this study?

The findings of this study will benefit understanding of how and why people commit to exercise this information could be used by individuals or the clubs or fitness organisations they belong to, to improve adherence to an exercise program through personal motivation.

5. Are there any possible risks from participation in this study?

There are no foreseeable risks associated with participation in this study.

6. What if I have questions about this research?

If you would like to discuss any aspect of this study please feel free to contact me through my supervisor Peter on (03) 63 24 32 93 (business hours). I would be happy to discuss any aspect of the research with you. Once the data has been analysed, I will present the findings of the research in Unigym's December issue of the monthly newsletter/on The Fitness Academy's Facebook page in December.

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee. If you have concerns or complaints about the ethical conduct of this study you may contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote the ethics reference number [H0014926]

**Thank you for taking the time to consider this study.
This information sheet is for you to keep.**

**If you wish to take part in this study, please login to the online survey at:
<https://surveys.utas.edu.au/index.php/678922/lang-en>**

*Leia Giacon
Student, Faculty of Health
University of Tasmania*

*Peter Tranent
Supervisor, Faculty of Health
University of Tasmania*



Appendix J

Participant Consent Form

**PARTICIPANT CONSENT FORM
BEHAVIOURAL SCIENCE/ PSYCHOLOGY
RESEARCH**

**Examining the role of motivation and cognitive change as functions
of exercise adherence in community populations**

1. I agree to take part in the research study named above.
2. I have read and understood the Information Sheet for this study.
3. The nature and possible effects of the study have been explained to me.
4. I understand that the study involves completing four questionnaires (*The Exercise Self-Regulation Questionnaire*, *The Self-efficacy for Exercise Questionnaire*, *The Benefits of Physical Activity Scale* and the *Stages of Exercise Change Questionnaire*) at three different times over the next three months of my gym membership.
5. I understand that participation involves no foreseeable risk(s) that could eventuate from this study or my involvement.
6. I understand that all research data will be securely stored on the University of Tasmania premises for five years from the publication of the study results, and will then be destroyed.
7. Any questions that I have asked have been answered to my satisfaction.
8. I understand that the researcher(s) will maintain confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research.
9. I understand that the results of the study will be published so that I cannot be identified as a participant.
10. I understand that my participation is voluntary and that I may withdraw at any time without any effect.

If I so wish, I may request that any data I have supplied be withdrawn from the research until 30th September 2015.

Participant's name: _____



Participant Consent Form {no: 1}

July 2015

Participant's signature: _____

Date: _____

Statement by Investigator

☐ I have explained the project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☒ The participant has received the Information Sheet where my details have been provided so participants have had the opportunity to contact me prior to consenting to participate in this project.

Investigator's name: Leia Giacon

Investigator's signature:

Date: 29/6/2015